Sensitivity analyses of biodiesel thermo-physical properties under diesel engine conditions - DTU Orbit (09/11/2017)

Sensitivity analyses of biodiesel thermo-physical properties under diesel engine conditions

This reported work investigates the sensitivities of spray and soot developments to the change of thermo-physical properties for coconut and soybean methyl esters, using two-dimensional computational fluid dynamics fuel spray modelling. The choice of test fuels made was due to their contrasting saturation-unsaturation compositions. The sensitivity analyses for non-reacting and reacting sprays were carried out against a total of 12 thermo-physical properties, at an ambient temperature of 900 K and density of 22.8 kg/m^3. For the sensitivity analyses, all the thermo-physical properties were set as the baseline case and each property was individually replaced by that of diesel. The significance of individual thermo-physical property was determined based on the deviations found in predictions such as liquid penetration, ignition delay period and peak soot concentration when compared to those of baseline case. Among all the properties, latent heat of vaporisation produced the greatest effect on the spray and soot developments under the tested conditions, as evidenced by a longer liquid penetration of 35.0% and a reduced peak soot concentration of 22.8%. Besides, coupled effects among the thermo-physical properties were also determined. Meanwhile, the effects of thermo-physical properties were found to vary with the addition of unsaturation levels and chemical kinetics in the simulation.

General information

State: Published
Organisations: Department of Mechanical Engineering, Fluid Mechanics, Coastal and Maritime Engineering, Thermal Energy, University of Nottingham, Malaysia Campus
Authors: Cheng, X. (Ekstern), Ng, H. K. (Ekstern), Gan, S. (Ekstern), Ho, J. H. (Ekstern), Pang, K. M. (Intern)
Pages: 341-352
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information

Journal: Energy
Volume: 109
ISSN (Print): 0360-5442
Ratings:
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.17 SJR 1.999 SNIP 1.798
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.276 SNIP 2.046 CiteScore 5.03
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.647 SNIP 2.63 CiteScore 5.7
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.54 SNIP 2.593 CiteScore 5.02
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.998 SNIP 2.25 CiteScore 4.25
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.609 SNIP 2.043 CiteScore 4
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.814 SNIP 2.725
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.729 SNIP 2.313

Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.106 SNIP 1.444
Scopus rating (2007): SJR 0.913 SNIP 1.481
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.875 SNIP 1.306
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.965 SNIP 1.203
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.711 SNIP 1.115
Scopus rating (2003): SJR 1.093 SNIP 1.496
Scopus rating (2002): SJR 0.952 SNIP 1.287
Scopus rating (2001): SJR 1.091 SNIP 1.078
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.82 SNIP 0.992
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 0.632 SNIP 0.659
Original language: English
Biodiesel, CFD (Computational fluid dynamics), Spray, Thermo-physical properties
DOIs:
10.1016/j.energy.2016.04.103
Source: FindIt
Source-ID: 2304590369
Publication: Research - peer-review › Journal article – Annual report year: 2016